Jun 10th, 12:00 AM

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PROGRESS OF THE BLEND-LINC 'ELECTRONIC JOURNAL' PROJECT

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Electronic communication networks enable people to exchange information, views and ideas by means other than paper and the spoken word. Material to be exchanged is entered into a computer store by a variety of means, and is accessed on-line through local terminals. These networks are relatively new and in the United Kingdom little explored from the user's viewpoint. Research is needed to establish their potential and to assess the problems and costs of using them for different purposes.

As a result, approval was given, by the British Library Research & Development Department, to a proposal to establish an experimental programme in electronic network communication. Birmingham University is providing and developing the hardware and software facilities, and Loughborough University is developing the documentation, training and the information community; thus we are organising the Birmingham and Loughborough Electronic Network Development (BLEND). Using the host computer at Birmingham University, a community of initially about 50 scientists (the Loughborough Information Network Community - LINC) is connected through the public telephone system to study various types of electronic journals and to explore other possible types of communication through this form of network.

The BLEND System therefore starts with the aim of experiencing and studying the problems of setting up an information community and establishing an experimental electronic journal. The concept of the electronic journal is one which involves using a computer to aid the normal procedures whereby an article is written, refereed, accepted and published. With the help of suitable software an author may enter a text into a system, and the editor, referees, and ultimately the readers, as well as himself, can have access to the text at their computer terminals. The procedures involved are somewhat similar to those already developed by various studies in the area of computer conferencing (cf. Hiltz & Turoff, 1978; Johansen, Vallee & Spangler, 1979).

PROGRAMME PLANS

Aims

The initial plans placed the principal emphasis upon a refereed papers journal. While that remains the starting point, the proposal for the project recommended exploring various other possible uses of electronic communication networks, and this widening of the scope was approved. As a result, the aims of the BLEND system programme are to explore and evaluate the usage of an electronic communication network as an aid to writing, submitting and refereeing papers, and also as a medium for other types of scientific and technical communication. (For more details of the programme plans, and for previous BLEND reports, see Shackel 1982 a,b and Shackel et al. 1983).

To further these aims it was planned, from the start of the programme from mid-1980, that several different communities, with different types of work and subject contents, should be brought on to the BLEND system during its operating life. Two such communities are already using BLEND, and others are under discussion.

The remainder of this paper will summarise the plans and progress during the first three years of the first community (the Loughborough Information Network Community - LINC).

The LINC Procedures

The subject of interest in the LINC programme is Computer Human Factors, and the members of LINC are all studying or involved with this topic. Approximately 40 members receive funds to cover telephone connection time equivalent to one hour per week at afternoon charge rates (which allows about 3 1/2 hours per week if all connection is in the evenings or at weekends). They have undertaken to submit one longer paper and one shorter 'dispatch' in each year of the programme.

The hardware and software facilities to support the programme are provided at Birmingham University. The large DEC 20 computer there is accessed via the public telephone network or via other networks or services (e.g. PSS in Britain, TRANSPAC in France, DatexP in Germany, etc.). The operation for BLEND is based upon a computer conferencing software suite - NOTEPAD (from Infomedia Corporation, California). This is resident within a 'shell' system which further simplifies the operation for users (Maude et al, 1983).

At first the procedures for submitting and refereeing papers will be very similar to traditional practice, while members become accustomed to the technology and its procedures. After members are familiar with the technology, formal experiments will be instituted with alternative refereeing and other procedures to explore and exploit the capabilities of the electronic medium.

From the beginning it was planned to provide alternative means of entering papers, alternative procedures for refereeing papers, etc. Therefore, from the start three methods for entering papers have been provided:

1. author or secretary directly on-line;
2. typical typescript (with corrections) sent to Loughborough for entry via secretary and word processor;
3. perfect typed manuscript sent to Birmingham for entry via OCR machine.

Copyright is not assigned to the journal but authors were at first asked to undertake not to offer papers to conventional journals until three months after they had been archived in an Electronic Journal. Because of delays caused by difficulties with refereeing when using the early versions of the system, this procedure was later chenged. Authors now undertake that a paper has not been published elsewhere but may submit it to a traditional journal at the same time as to BLEND-LINC.

When refereed papers are published in conventional journals, an agreed footnote will be included on the first page such as "This paper has been refereed, accepted and archived (in electronic form only) in the British Library R&DD experimental electronic journal 'Computer Human Factors'".

Types of Journal to be explored

Types of communication between scientists can range from the very informal chit-chat over coffee, through discussion and questions at conferences, to the very formal refereed papers journal (see Table 1). It was planned that as many of these as possible should be explored during the LINC programme.

TABLE 1 Types of Communication and 'Journal' Planned for LINC Programme

1.	Chit-chat	Informal
2.	Work Messages	:
3.	LINC News - network & related information in a monthly newsletter	:
4.	Enquiry-answer system between experts	:
5.	Bulletin - project and work progress reports	:
6.	Annotated Abstracts Journal	:
7.	Discussion and Questions on Papers	:
8.	Poster Papers Journal	:
9.	Refereed Papers Journal	Formal

Other aspects include co-operative writing and access to the journals by 'Readers Only'. Of course, the plan will be implemented in stages; the programme started with 1, 2, 3, 7, 8, and others are being introduced in due time.

BLEND-LINC IN RELATION TO THE SERIALS CYCLE

The Activity Cycle for a Serial

In the spheres of publishing, libraries and information science there is growing attention towards a whole range of electronic possibilities. Since this project has sometimes been given the epithet 'electronic publishing', which it is not, its place in relation to the complete cycle of activities involved in producing and using serials may usefully be clarified.

The sequence of activities, in a series of broad functional categories, is given in Table 2. The papers submitted by authors in the LINC programme, and eventually mounted in the Poster Papers Journal or Refereed Papers Journal, are not published; they are archived in electronic form only. It is emphasised to all LINC members that, when they read a paper in the 'Journal' or take a printout of it, this paper has the status of a pre-publication draft sent to them in confidence by the author. Therefore, the BLEND-LINC programme addresses the first three activities only, above the dividing line, in Table 2.

TABLE 2 The BLEND-LINC Place in the Activity Cycle of a Serial

Authoring
Refereeing
Editor accepting

BLEND-LINC stops here

Publishing
Marketing
Distributing/delivering

Storing - reading
Abstracting - reading
Retrieving - reading

The Author-Editor Cycle

The activities to be explored within the BLEND-LINC programme, as regards a formal refereed papers journal, are expanded in Table 3. In the first phase of the programme it was necessary to modify and develop the system until it could tolerably subserve all these activities, so that they could be undertaken experimentally. Then the possibilities and limitations of the technology, and the improvements needed, could be investigated.

TABLE 3 The Traditional Author-Editor Cycle for Refereed Papers

```
.- - -> Author writes
.           :                    Author sends draft to
.           :                    colleagues for comment
.        Author sends to Editor
.           :
.        Editor sends to Referees
.           :
.        Editor <= = =>  Referees interaction
.           :
.           :   Referee <= = => Referee interaction?
.           :
.           :   Referee <= = => Author interaction?
.           :
 - - -<- - : - Editor asks for revisions?
           :
        Editor accepts
                                 Author sends pre-publication
                                 copy to colleagues
(BLEND-LINC stops here)
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Editor sends to Publishers

etc.

PROGRESS OVERVIEW

The first face-to-face meeting of the LINC community was held on 31 October 1980, and 42 out of a possible 51 persons attended. System manuals, training manuals and membership cards (with computer log-in passwords) were issued. Trials usage by LINC of the network began on 15 November 1980, and the BLEND system was available for full usage from 15 January 1981. Some of the milestones from the beginning are as follows.

1979	Sept.	Invited first proposal submitted to BLR&DD
1980	April	Visit to USA by Project Director to gather data
	August	Software version 1.1 collected from INFOMEDIA
		Software tests begin
	Sept.	Project announced by BLR&DD
		First community (LINC) invited and arranged
	Oct. 31	First LINC face to face meeting
	Nov. 15	Trial usage of software by LINC begins
	Oct.-Dec.	Interviews of LINC members and assembly of preliminary research statistics
1981	Jan. 15	BLEND system fully available
	June-July	Structured interview survey by telephone
	August	First papers submitted and Poster Papers Journal begins
	Dec. 14	Second LINC face to face meeting
	Dec. 15-18	BLR&DD programme of public seminars by BLEND Team
1982	Feb. 15	Software version 2.1 (specially enhanced) open to all
	June	Second community starts - W. Midlands region of M.E.P.
	October 1	First number of Refereed Papers Electronic Journal 'Computer Human Factors'
	October	LINC Members' teleconferences to discuss future plans
	Nov. 23	Third LINC face to face meeting
1983	January	Purchase of advanced micro-computers for small sub-group of volunteers approved by BLR&DD
	February	New community starts - UK Library Schools, as 'readers only' for teaching purposes
	March	Extension of programme to 4 years approved by BLR&DD
	April	Demonstrations on-line to BLEND at Stanford University (USA) and at INRIA (France)
	May 1	Second number of Refereed Papers Electronic Journal 'Computer Human Factors'
	May 1	References Abstracts & Annotations Journal started
	May 24-26	BLR&DD programme of public seminars by BLEND Team
	June 1	Approval for 2 new communities to join BLEND - a Biotechnology Consortium and FERN (Further Education Research Network)
	June 7-9	Demonstrations on-line to BLEND at IATUL Conference, Essen (Germany)
	Aug. 1	'Software Reviews' Journal on-line in BLEND started by LINC Member Dr. Thomas Green

THE FIRST YEAR to OCTOBER 1981

The progress in the first year and the results of the first user survey have been described in Shackel (1982b); they are summarised here under the headings of software and survey.

Software

The NOTEPAD software system was chosen for its reliability and simplicity and for its data recording and analysis components. However, it was recognised from the start that NOTEPAD would need to be modified and developed for journal usage. Version 1.1 was mounted in September 1980; from project team tests some first changes were made by Infomedia and Version 1.2 was mounted for the January start. From trials usage by LINC members, and from the first two months of system usage, a substantive set of requirements was negotiated with Infomedia for successive development and provision in Versions 1.3 and 2.1 (scheduled for May and September but delayed by problems at Infomedia).

At Birmingham, in addition to organising all the computing work and the successive developments with Infomedia, the team members have contributed major enhancements, e.g. to provide a choice of text editors, to facilitate users moving around inside the system, and to enable files to be copied easily from one separate part of the system to another (c.f. from one journal to another). Thus, the project team provided for the development of the software system as far as possible at that time towards a form appropriate for the types of usage involved. Experience and tests would show what further improvements are needed from this first basis.

Survey

In June-July 1981 a questionnaire survey was conducted by telephone (Pullinger, 1982). About one-third of LINC members were regular users, another third intermittent, and the other third had not entered at all. The intermittent usage was caused by pressure of regular work, balance of priorities, difficult access to terminals, etc. The non-usage was caused by lack of equipment (see later). The pattern of usage and reasons are similar to the results of the USA refereed papers journal project (Sheridan et al., 1981).

The documentation supplied to users was considered useful and entirely sufficient. The user support provisions were strongly commended.

By the end of the first year of LINC in October 1981 there were two papers archived in the Poster Papers Journal and four other papers were in various stages of progress.

THE SECOND YEAR to OCTOBER 1982

Assessment of Needs

Both the discussion parts of the questionnaire survey and the experiences and observations of the project team have identified a wide range of desirable improvements to hardware, to communications and to the NOTEPAD software. These are grouped together under four headings below, and then the progress is surveyed in the next two sections.

Hardware and Communications. The diversity of hardware and the limited standardisation between terminals and other equipment from different manufacturers is the biggest problem. Therefore, graphs and diagrams are limited to the alpha-numeric symbols and spacing available, in effect, upon an 80 column by 24 line typewriter (80x24 being the nearest to a common denominator amongst Video Display Units). The potential need for better graphics has been expressed by most users.

With regard to communications three needs have been emphasised: auto-dialling, auto-login and faster speed; these are apart from frustrations caused by installation delays, unreliability and line noise interference. To integrate the usage of this type of system into busy working lives, users clearly need to save time and especially memory load; auto-dialling and auto-login would save both. Again, for interactive usage over public telephone networks 300 baud (30 characters per second) was becoming standard; but the 1200 or 2400 baud minimum reasonable speed for scanning and editing lengthy text is only now becoming readily available.

Consistency. The human-computer dialogue needs to be consistent from the level of abbreviations for commands right through to the actions required at points where the purpose and procedure is similar to the user's previous experience (as for example with a typewriter). Using the last point as an illustration, the original ending for messages in NOTEPAD was to strike the carriage return twice; however this method is what many typists are familiar with doing between paragraphs, and also it could not be used in a conceptually consistent manner throughout the system. This has been changed to a control command which is used either in a local microcomputer, or in the main computer editor, or in ending a message in BLEND, to mean one and the same thing in each case from the user's viewpoint.

Handling large pieces of text. The demands on software facilities for handling paper-length pieces of text in writing, editing and reading are very different from, say, those for average message lengths found in electronic mail. In BLEND, pieces of text the length of a paragraph need and are now able to be written, edited or read either separately from, or embedded in, the rest of the paper. Editing has been introduced at 3 levels: a simple line replacement editor with 3 commands when writing messages or text (in conjunction with the standard back-space delete facilities); a choice of text line-editors with intra-line facilities before sending text; replacement of a whole paragraph with an edited version (or completely new text).

Other facilities are needed to facilitate local preparation of text (e.g. in a word-processor) and transmission in a 'block' to the host computer at Birmingham. Similarly, facilities are needed to prevent anyone adding (accidentally or otherwise) comments and messages to prepared public texts such as newsletters and journal papers, while at the same time enabling precisely that kind of response in an appropriate location.

'Knowing where one is'. The contents of the BLEND system may be considered to be in a 2-level hierarchical tree structure (level 1 = PROJECT and level 2 = ACTIVITY - the names given by NOTEPAD). Users read and write in the different 'conferences' at the ACTIVITY level (see Table 4). It is a common experience that 'knowing where one is' is substantially harder without the secondary cues with which we are all familiar when finding our way around filing systems or journals. BLEND

has sought to alleviate these difficulties by (a) giving cues to 'where one is' in the form of the title of both levels as automatic reminders; (b) enabling the user to check his position with 3 key presses to get the titles of both levels; (c) enabling the user to set a page title as a constant reminder if so desired; (d) giving cues of where other users are whenever the list of ACTIVITY titles is presented. These minor modifications may be considered as only a start to this very real problem for any structured database.

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TABLE 4 NOTEPAD Structure as used for BLEND-LINC

PROJECT: News	PROJECT: Author	PROJECT: Poster	etc.
ACTIVITY:	ACTIVITY:	ACTIVITY:	
1. Messages	1. Advice & Help	1. Editorial Messages	
2. Chit-Chat	2. Messages to & from Editor	2. Poster Papers Index	
3. Who's Who	3. Private to Author - Smith	3. Dodd WP - (title)	
4. LINC NEWS	etc.	4. Wilson P - (title)	
etc.		etc.	

PROJECT is like a separate forum or conference building
ACTIVITY is like a separate group meeting or conference room

Within each Activity members may:- write and read (private) NOTES; write and read (public) ENTRIES; check STATUS; EDIT; use other SERVICES, such as RUN programs (eg. to SEND a paper from a word-processor; or to COPY a file from one project to another; or to READ a paper and be able to skip to and fro between paragraphs or from a paragraph to the reference list and back again, etc.); use SELECT to join another Activity; or QUIT that project.

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Software Development

Most of the changes to the software needed and specified, to improve consistency, handling large pieces of text, and 'knowing where one is', were accepted by Infomedia for implementing in an agreed version 2 of NOTEPAD for BLEND. This was scheduled for September 1981, so that by the start of LINC's second year the BLEND system was expected to be in a tolerable form for usage for journal papers.

For various reasons Infomedia was unable to keep to the agreed schedule. While in the USA during September to end November 1981 the Project Director (Shackel) was able to visit Infomedia at the end of October. The purpose, rationale, method of operation and display formats for all the agreed improvements were worked through with the Infomedia staff member who would be implementing them. Also the changes planned by Infomedia for version 2 were similarly reviewed. After further delay caused by loss of the tape in the Christmas mail, version 2 was finally tested and opened to BLEND on 15 February 1982.

As experience was gained with proper usage so other needs and possible improvements were recognised. The facility within NOTEPAD enabling programs to be RUN, while still remaining inside that software suite, was used by the project team to develop and test enhancements. So the program READ (see Table 4), a software aid for reading on-line, was placed on open trial, and the specification for a program REFEREE, to give software support to refereeing, was developed.

Progress

Hardware. Advice on hardware and communications has been provided by the project team from the start. However, since funds could not be available to provide all members with terminals, they have had to use whatever equipment was available to them or could be purchased from other funds. As a result many difficulties have arisen not through fundamental limitations of present technology but because of the differences in technology or the experiences of various individual members. For example, at least two members have only the older teletype working at 110 baud; several members have direct, i.e. very fast, access into large computers with operating procedures which are different from DEC and NOTEPAD, and so have problems in learning new methods for familiar tasks; some members are familiar with other mail or conference systems, such as ARPAnet or COM, and thus again have problems with 'unlearning' different procedures.

Communications. The one aspect of common experience is the need for a faster communication rate to subserve the on-line interaction when reading, editing or refereeing papers. From the very beginning the project team aimed for at least 1200 baud (120 characters or 20 words per second) in both directions. At first modems were not available from British Telecom, and then considerable problems were experienced with the installation at Birmingham. During this year experimental usage was continued in three locations, with mixed results because of spurious signals apparently generated inside the modem in response to line noise.

User Support. At the same time as the software developments, and to make support informaton consistent and easy for a mixed (computer-naive and computer-experienced) community who are mostly occasional users, all user support materials were fully revised. In addition to the '?' facility of NOTEPAD, the support consists of a small credit card sized log-in and structure reminder, a users guide, on-line help, and a one working day response via answerphone for problems. The users guide has the majority of information accessed by two different routes, one as a list of facilities (i.e. what is traditionally offered in manuals) and the other as structured sequences of typical actions that a user may wish to do. Designed as a rapid access aid, this was well-received and has undergone further testing, iterative refining and validation.

Usage. The pattern of usage has remained much the same as was found in the survey during the first year (see above). This is to be expected since the reasons for occasional use remain the same - fitting this voluntary activity into an existing work schedule, balancing priorities, and access to terminals. A special Users' Conference was held in BLEND-LINC, from Monday 4 October for three weeks, to review LINC experience so far and to assist with planning the programme for the rest of the project to the end of December 1983.

Papers and Journals. Despite the difficulties there was considerable use of the system for various types of more informal communication. Moreover, there were at the end of the second year 12 papers mounted in the Poster Papers Journal, and 8 papers offered to the Refereed Papers Journal. The first number of the latter, 'Computer Human Factors', was archived with an editorial, four papers, a book review, and 'Activity' locations for discussion and questions by readers on each; 'Computer Human Factors' No.1 was open to LINC members on 1st October 1982.

THE THIRD YEAR to OCTOBER 1983

Plans for Year Three

The Users' Teleconference reviewed a number of possible plans and activities for the third year of the programme, including even the possibility of establishing a form of editorial processing centre (Shackel, 1982c). From the discussions during the teleconference, and the third LINC face-to-face meeting on 23 November, it was recommended that the additional aims in year three should be to develop and study other types of journal, to develop additional communities for usage and evaluation of BLEND for different types of work, and to explore the potential of improved technology (including colour) by supplying better facilities to between 10 and 20 users.

In addition to these new developments the main work of the programme, in studying electronic network communication between scientists, especially in the authoring and refereeing of papers for subsequent 'publication' in electronic journal form, should continues steadily.

Extension of Programme

Some time had been lost earlier in the programme while waiting for software developments, so that the exxperimental on-line usage with better software had been delayed by six months; however, the progress of the BLEND project was considered very satisfactory by the sponsoring British Library Research & Development Department. An appraisal of the progress to date and an overview of possible future developments was requested and written (Shackel 1982d) which was approved by the BLR&DD New Technology Committee. As a result an extension of the BLEND programme was approved with on-line usage available until 30 June 1984 and final reports to be completed by 30 September 1984.

Progress

Hardware and Communications. To test the value of better terminal and communication facilities the British TORCH microcomputer was chosen after a survey of machines worldwide. None was found to have the TORCH's combination of facilities including auto-dial, auto-login, self-contained modem, word-processing, on-line file transfer, 1200 baud communication rate, sound synthesiser and colour display. Initially 10 different

locations have received a TORCH, in February/March 1983, and others may be supplied. As well as studying the contribution of improved technology to regular usage of BLEND, the aim is to explore the potential of other 'forefront' facilities such as colour and automatic 'mail' transfer TORCH-to-TORCH unattended overnight.

Developments. Three new communities are being developed. A consortium of 14 UK Library Schools joined BLEND in February 1983, with 'reader only' privileges so that students could become familiar with the system and do small studies of its usage. In June approval was given for support to a Biotechnology Consortium, linking various academic research groups in this fast-growing field, and to FERN, the Further Education Research Network of over 300 lecturers in colleges of further education, which has developed during the last four years and now will explore the usage of an electronic network to supplement their existing bulletin and journal.

Demonstrations and comparisons of the electronic journal format with traditional paper journals have proved to be in some demand. The papers by Shackel (1982a,b) and by Shackel et al. 1983 can be compared in several printed journal versions and in electronic form in BLEND. Similarly, with the permission of the publishers, North-Holland, the papers from Vol.1 no.2 of the new journal Computer Compacts were mounted in BLEND for demonstration and comparison at the IFIP Congress (September 1983).

Two new journals have been developed and mounted during the year. The 'References, Abstracts and Annotations Journal' started on 1 May. This contains two main sections: (1) a collection of references and annotated abstracts from five bibliographies in human-computer interaction prepared between 1978 and 1982, and (2) the references and author's abstracts of papers in the current numbers of seven regular journals from January 1982. The aim is to explore the provision and usage of such material on-line through the same terminal being used by scientists for other types of communication. In June a LINC member, Dr. Thomas Green, was authorised to start a journal for fairly short papers reviewing software packages of interest to typical users in the LINC community. 'Software Reviews' was open to LINC members from 1 August 1983.

Usage. The pattern of usage has continued steady but with an increase in frequency and amount (from subjective appraisal) by most of the TORCH users. An extensive teleconference is in progress among a group of LINC members to specify human factors needs in future electronic mail systems, and a paper is being written jointly for a forthcoming conference on messaging systems. The various types of more informal communication continue steadily, as do the submissions of papers. The second number of the Refereed Papers Journal 'Computer Human Factors' was mounted on 1 May 1983; over 15 papers have now been submitted for refereeing, and 25 papers have been mounted in the (unrefereed) Poster Papers Journal.

APPRAISAL

So, it may reasonably be asked, how far has progress reached toward the communication of research results via electronic means? The brief answer is "perhaps just about at first base". There have been a number of prospective studies, such as those by Lancaster (1978) and Meadows (1980) and the Royal Society report (1981). Quite properly all point to the vision; and we believe the vision is valid and not a mirage. But there are many technological slips on the way.

Moreover, many organisational, bureaucratic, social or psychological problems were revealed by the first year survey, and subsequent experience, to add to the present technological limitations. Some of these are listed to illustrate the diversity of difficulties which beset the introduction of a radically new system into existing situations.

1. Delays up to 5 months in installing lines and modems by British Telecom.
2. Bureaucratic and 'political' resistance to installing less noisy direct telephone lines instead of going through the campus or institution switchboard, because they are not under control nor monitored by the organisation.
3. Existing equipment, e.g. mainframe or local network, not able to be used to connect to an outside computer.
4. Therefore, existing familiar procedures (e.g. familiar editor, network commands or local mainframe command language) not able to be used, with consequent 'unlearning and new learning' penalty to use BLEND on DEC20.
5. Bureaucratic and 'political' resistance to a terminal being in a LINC member's room (e.g. this might unbalance status relationships, or the terminal must be seen as 'owned' by the institution and not by the individual).
6. Dislike or avoidance by users of the conflict situation when others are found to be using a shared terminal or modem or external telephone line.
7. Time constraints upon the use of equipment at the user's end, and upon the use of the Birmingham DEC20 computer during term time (10-12 and 2-4 weekdays) because of teaching class workloads.

The attitudes inside institutions towards 'ownership' and control of new technology may be expected to change as the general attitudes in society change. The technology will improve considerably; indeed all the facilities which we at present speculate to be needed do exist somewhere already, but of course at a price.

The ultimate and most important issues are those addressed by psychology/ergonomics/human factors. The terminals must be easy to use and appropriate for the tasks involved. The software must be easy to learn and well-matched to all the procedures required of it by the users. The whole system must be readily available, and either be easier and quicker to use than existing methods or be so much more powerful that the extra time or effort involved is considered by the user to be on balance an acceptable cost.

These views are reinforced by the attitudes of LINC members in response to the various problems over the three years. They have reacted not as might be expected in response to research difficulties but more in an 'all-or-nothing' way; this response is entirely reasonable. They are not members of the research team with a formal commitment to the project; they are busy researchers, system designers or teachers who often react to BLEND as to other facilities or services. If access is not particularly easy and if using it is not especially relevant to this week's or this month's main work tasks, then it will have to wait (exactly as do the successive issues of journals on the shelves of the library across the campus, even very relevant journals, when students and other priorities are pressing).

Therefore, it seems evident that one other requirement must be satisfied in addition to the issues discussed above. If a significant process is to be integrated into the regular pattern of daily work, then it must be reliable and fully operational for 24 hours a day, and it must be available on or beside the work desk exactly as is the telephone. While this opinion may seem self-evident in some circles, its acceptance and implementation to subserve electronic journals for scientists may take somewhat longer.

CONCLUSION

Many difficulties have been experienced by users, for example with organisations, telecommunications and software systems, in trying to incorporate use of the BLEND system into their established working routines; nevertheless BLEND has been developed as planned and anticipated in conjunction with LINC. More than 40 papers have been submitted by LINC members, 25 to the Poster and more than 15 to the Refereed Papers Journal. This progress could reasonably be compared with the time schedule for the start of any new journal. These papers and the willing participation of the LINC community continue to support the breadth of experimentation originally envisaged for this programme.

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